

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellants: Edelen et al.
Serial No.: 10/706,457
Filed: Nov. 12, 2003
For: MICRO-FLUID EJECTING DEVICE HAVING
EMBEDDED MEMORY DEVICE
COMMUNICATING WITH CONTROLLER
Examiner: Nguyen, Lam S.
Group Art Unit: 2853
Confirmation No.: 6755

APPELLANTS' BRIEF ON APPEAL

Mail Stop: Appeal Brief-Patents
Commissioner for Patents
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Sir:

This appeal brief is filed following the Notice of Appeal filed on September 1, 2006, in response to the Final Office Action mailed on May 2, 2006, and the Advisory Action mailed on July 19, 2006.

REAL PARTY IN INTEREST

The real party in interest is Lexmark International, Inc., 740 West New Circle Rd., Bldg. 082-1, Lexington, KY 40550-0999.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

STATUS OF CLAIMS

Claims 1-28 are pending in the case. Claims 1-2, 4-8, 13-14, 16-20 and 23-28 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,474,782 to Furukawa in view of U.S. Patent No. 5,544,103 to Lambertson. Claims 9-12 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa in view of Lambertson and further in view of U.S. Patent No. 6,439,697 to Axtell et al. Claims 3 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa in view of Lambertson and further in view of U.S. Patent No. 4,876,668 to Thakoor et al.

As shown in the Claims Appendix, the claims on appeal are claims 1-28.

STATUS OF AMENDMENTS

An amendment was submitted on June 30, 2006, subsequent to the Final Office Action dated May 2, 2006. However, according to the Advisory Action of July 19, 2006, the after-final amendment was not entered.

SUMMARY OF CLAIMED SUBJECT MATTER

The invention set forth in the specification provides a substrate (16) for a micro-fluid ejecting device, such as a substrate of a printhead of an inkjet printer. (See FIGs. 1, 2 and 9; paragraph [0018] et seq.) The substrate has a plurality of fluid ejection devices (28) and a plurality of driver transistors (70) for driving the fluid ejection devices (See FIGs. 9 and 10; paragraph [0031] et seq.) The substrate is also provided with a programmable memory matrix (38). (See FIGs. 3, 9 and 10; paragraph [0020] et seq.) The programmable memory matrix contains embedded programmable memory devices (40, 42, 44) that are operatively connected to the micro-fluid ejecting devices. The memory matrix is for storing information which may be used in the operation of the micro-fluid ejecting device. For example, the memory matrix may be used to provide identification information for a printhead, alignment characteristics of the printhead or fluid properties of ink used in the printhead, such as ink color. Also, the memory

matrix may be used to store information that is continually updated as a printhead is used, such as ink levels or fluid use data. (See paragraph [0032].)

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1-2, 4-8, 13-14, 16-20 and 23-28 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,474,782 to Furukawa in view of U.S. Patent No. 5,544,103 to Lambertson.

2. Claims 9-12 and 21-22 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa in view of Lambertson and further in view of U.S. Patent No. 6,439,697 to Axtell et al.

3. Claims 3 and 15 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa in view of Lambertson and further in view of U.S. Patent No. 4,876,668 to Thakoor et al.

ARGUMENT

In the Final Office Action, Claims 1-28 were rejected as being obvious in light of various combinations of references. As will be evident from the following discussion, the rejections are not well taken. A fundamental error in all of the rejections is a failure to explain the reasons why one of ordinary skill in the art would have been motivated to select the cited references and to combine them to render the claims obvious. Accordingly, a *prima facie* case of obviousness has not been made out.

1. The 35 U.S.C. §103(a) rejection of claims 1-2, 4-8, 13-14, 16-20 and 23-28 in view of the combination of U.S. Patent No. 6,474,782 to Furukawa and U.S. Patent No. 5,544,103 to Lambertson.

Claims 1-2 and 4-8 are directed to a substrate for a micro-fluid ejecting device, such as an inkjet printhead. The substrate includes fluid ejection devices, driver devices for driving the fluid ejection devices, and a nonvolatile programmable memory matrix containing embedded programmable memory devices. According to claims 1-2 and 4-8, the memory matrix is for storing information for operation of the micro-fluid ejecting device. As noted in paragraph [0032]

of the specification, since the memory matrix is programmable, it may be used to store information that changes over time as the printhead is used, such as fluid levels or fluid use data.

Claims 13-14 and 16-20 are directed to an inkjet printer cartridge for an inkjet printer. The printer cartridge includes a cartridge body having an ink supply source. A printhead is attached to the cartridge body. The printhead includes a substrate having ink ejection devices, driver devices for driving the ink ejection devices, and a nonvolatile programmable memory matrix containing embedded programmable memory devices. Attached to the substrate is a nozzle plate from which ink is ejected upon activation of the ink ejection devices.

Claims 23-28 are directed to a printhead for a micro-fluid ejecting device. The printhead includes fluid ejection devices, driver devices for driving the fluid ejection devices, and a nonvolatile programmable memory matrix containing embedded programmable memory devices.

The Furukawa reference describes a printhead substrate having ink-ejection heaters, driving circuits, and an on-board Read-Only Memory (ROM) block for storing information that is unique to the substrate, such as heater resistance values or the ON resistance values of driver transistors. (Furukawa, column 13, lines 3-27.) It is well known to those skilled in the art that ROM is a type of nonvolatile memory used for storing data in permanent, or nonerasable, form. (Evidence Ref. 1.) Thus, the memory described by Furukawa is for permanent storage of data. It is not capable of being erased or reprogrammed. Accordingly, as noted by the Examiner, the Furukawa reference is silent regarding a reprogrammable memory matrix.

The Lambertson reference describes an Electrically Erasable Programmable Read-Only Memory (EEPROM) device that comprises an array of memory cells. Each memory cell includes a first layer that serves as a floating gate and a second layer that serves to erase the floating gate and to select the memory cell for reading and programming. The Lambertson device is erasable by applying a voltage above a certain threshold level to the floating gate. There is no description of erasing the Lambertson EEPROM device by exposing the device to ultraviolet light.

For the reasons set forth below, Appellants submit that there is no motivation to combine the Furukawa and Lambertson references to arrive at the inventions of claims 1-2, 4-8, 13-14, 16-20 and 23-28.

To reject claims under 35 U.S.C. § 103, an examiner must set forth a prima facie case of obviousness. On appeal to the Board, an applicant can overcome an obviousness rejection by showing insufficient evidence of prima facie obviousness or by rebutting the prima facie case with evidence of secondary indicia of nonobviousness. *In re Kahn*, 441 F.3d 977 (Fed.Cir. 2006), *citing In re Rouffet*, 149 F.3d 1350 (Fed.Cir.1998). To establish a prima facie case of obviousness based on a combination of elements disclosed in the prior art, the Board must articulate the basis for a conclusion that it would have been obvious to make the claimed invention. *Id.* This requires the Board to “explain the reasons one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious.” *Id.* When the Board does not explain the motivation, suggestion or teaching that would have led the skilled artisan at the time of the invention to the claimed combination as a whole, it is inferred that hindsight was used to conclude that the invention was obvious. *Id.*

As the Federal Circuit stated in *In re Kahn*, “[a] suggestion, teaching, or motivation to combine the relevant prior art teachings does not have to be found explicitly in the prior art, as the teaching, motivation, or suggestion may be implicit from the prior art as a whole, rather than expressly stated in the references.” *Id* at 987. “The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and the nature of the problem to be solved as a whole would have suggested to those of ordinary skill in the art.” *Id* at 988, *citing In re Kotzab*, 217 F.3d 1365, 1370 (Fed.Cir.2000). Conclusory statements are not sufficient to sustain a rejection on obviousness grounds. Rather, “there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *Id.*

Regarding claims 1-2, 4-8, 13-14, 16-20 and 23-28, Appellants submit that one of ordinary skill in the art would not have been motivated to select the cited references and to combine them to render the claimed inventions obvious. As discussed above, the Furukawa reference describes a ROM memory device for permanently storing printhead-related information, such as heater resistances or heater ON values. There is no suggestion in Furukawa that such information would change over time. Thus, Furukawa does not suggest any need to periodically update information stored on the printhead. If the designer of the Furukawa device

had perceived such a need, then a known EEPROM device, such as described in the Lambertson reference, could have been incorporated into the Furukawa device.

The examiner states that one of ordinary skill in the art would have been motivated to modify the memory of the Furukawa device to be reprogrammable as taught by Lambertson. According to the examiner, “the motivation for doing so would have been to enable the density of memory cells to be increased as taught by Lambertson.” (Office Action, page 4.) Appellants submit that the examiner’s statement of motivation lacks any rational underpinning to support the conclusion. Nowhere does Furukawa suggest any need to include reprogrammable memory on a printhead or to increase the density of memory cells on a printhead. Lambertson also expresses no concern about or need for replacing a nonprogrammable ROM device, such as described in Furukawa, with a page-erasable EEPROM device. Rather, Lambertson is concerned with providing the full-featured reprogramming capabilities of an EEPROM in a device having the compact size of an EPROM. (Lambertson, col. 1, line 65 – col. 2, line 6.)

In summary, the examiner has failed to articulate a rational reason for modifying the printhead described by Furukawa to include the EEPROM device described by Lambertson. Based on the examiner’s failure to state any sound reason for the combination of references, appellants must conclude that the examiner has instead used hindsight to find the inventions of claims 1-2, 4-8, 13-14, 16-20 and 23-28 obvious. Accordingly, the rejection of claims 1-2, 4-8, 13-14, 16-20 and 23-28 over the combined references is in error and should be reversed.

2. The 35 U.S.C. §103(a) rejection of claims 9-12 and 21-22 in view of the combination of Furukawa and Lambertson, and further in view of U.S. Patent No. 6,439,697 to Axtell et al.

Claims 9-12 depend on claim 1 and further require that the memory matrix is erasable by ultraviolet (UV) light. The substrate of claims 9-12 further comprises a layer disposed adjacent the programmable memory matrix. This layer has properties sufficient to block UV light having a wavelength below about 400 nanometers.

Claim 21 depends on claim 13 and further requires that the memory matrix is erasable by UV light. Claim 21 also calls for a photoresist layer disposed adjacent the programmable memory

matrix, where the photoresist layer has properties sufficient to block UV light having a wavelength below about 400 nanometers.

Claim 22 also depends on claim 13 and also requires that the memory matrix is erasable by UV light. According to claim 22, the nozzle plate comprises a polyimide nozzle plate having properties sufficient to block UV light having a wavelength below about 400 nanometers.

For the reasons set forth below, appellants submit that the UV-blocking layers of claims 9-12 and 21 and the UV-blocking plate of claim 22, in combination with the other limitations defined by independent claims 1 and 13, are not disclosed or suggested by the cited art.

The examiner rejected claims 9-12 and 21-22 based on a combination of three references. Furukawa was the base reference. Lambertson was cited to show a memory device that was erasable by UV light, and Axtell was added to show a plate that would block UV light. One problem with this combination is the addition of Axtell without sufficient motivation to substitute the plate of Axtell for anything in the other devices of the other references.

As discussed above, one may not pick and choose elements from a variety of references and combine those elements with the benefit of hindsight from the claimed invention. Instead, there must be a motivation to combine the elements. The examiner apparently recognizes this law by citing a motivation, namely, that adding the plate of Axtell would be motivated by the need to protect UV-sensitive memory devices from UV light.

There are at least two problems with the examiner's reasoning. First, it assumes that UV protection is necessary or desirable. None of the references teaches either. Appellants find nothing in the Lambertson reference to provide or suggest UV protection for a memory device. The second problem is that the examiner assumes that the nozzle plate (13) of Axtell blocks UV light. There is no indication in Axtell that the nozzle plate (13) blocks UV light. In Axtell, UV is mentioned only once and that reference does not teach blocking UV light. At column 1, line 52, Axtell states that certain prior art devices have ink barriers that are cured by UV light. This is not a teaching of blocking UV to protect a memory device. It does not even mention a memory in the context of UV protection, and it does not teach that anything blocks UV light.

In the portion of the Axtell reference cited by the examiner (column 4), it mentions that the nozzle plate (13) is made from a polymer that may or may not be nickel plated. This section

of the patent does not teach or suggest that the plate (13) is designed to block UV light. Some polymers do not block UV light, and even a nickel-plated polymer may not block UV light. For example, sun glasses, windows, and windshields may be made out of polymers having metal platings that transmit light, and depending on the polymer and the density of the plating, UV light could be transmitted.

Also, even if one assumes that the nozzle plate (13) described by Axtell would block UV light, there is still no suggestion to combine the teachings of Axtell with the teachings of Furukawa and Lambertson. Without a suggestion of a need to block UV light, there is no incentive to combine. Again, however, it is not appropriate to assume that the Axtell plate would block UV because it does not make a teaching with regard to any UV blocking characteristics of the nozzle plate (13).

In view of the above, it is respectfully submitted that dependent claims 9-12 and 21-22 are allowable over the combination of Furukawa, Lambertson and Axtell. Accordingly, the rejection of claims 9-12 and 21-22 over the combined references is in error and should be reversed.

3. The 35 U.S.C. §103(a) rejection of claims 3 and 15 in view of the combination of Furukawa and Lambertson, and further in view of U.S. Patent No. 4,876,668 to Thakoor et al.

Claims 3 and 15 depend from independent claims 1 and 13, respectively. Claims 3 and 15 further require that the embedded programmable memory devices of the memory matrix have a memory density of greater than about 200 bits per square millimeter.

Although the Thakoor reference addresses memory density in a memory device, Thakoor provides no motivation or suggestion to modify the device disclosed by Furukawa (ROM memory on a printhead) based on the teachings of Lambertson.

Thus, for the same reasons as set forth above regarding claims 1 and 13, appellants submit that the examiner has not presented a *prima facie* case of obviousness of claims 3 and 15. None of the cited references provide any motivation for combining the teachings of Furukawa and Lambertson to replace a ROM device with an EEPROM device. Therefore, claims 3 and 15 patentably define over the combination of Furukawa, Lambertson and Thakoor. Appellants request reversal of the rejection of claims 3 and 15.

With respect to this appeal, the Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 12-2355.

Respectfully submitted,

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CLAIMS APPENDIX

Claims on Appeal:

1. A substrate for a micro-fluid ejecting device, the substrate comprising:
a plurality of fluid ejection devices;
a plurality of driver devices for driving the plurality of fluid ejection devices; and
a nonvolatile programmable memory matrix containing embedded programmable memory devices, the matrix being capable of being operatively connected to the micro-fluid ejecting device for storing information for operation of the micro-fluid ejecting device.
2. The substrate of claim 1 wherein the embedded programmable memory devices comprise transistors selected from the group consisting of PMOS and NMOS floating gate transistors.
3. The substrate of claim 1 wherein the embedded programmable memory devices have a memory density of greater than about 200 bits per square millimeter.
4. The substrate of claim 1 wherein the programmable memory matrix comprises floating gate transistors.
5. The substrate of claim 1 wherein the programmable memory matrix comprises more than 128 memory devices.
6. The substrate of claim 1 wherein the embedded programmable memory devices are programmable by applying a voltage of greater than about 8 volts for at least about 100 microseconds.
7. The substrate of claim 1 wherein the embedded programmable memory devices will pass from about 10 to about 200 microamps of current at about 2 volts in a programmed state.
8. The substrate of claim 1 wherein the embedded programmable memory devices will pass less than 3 microamps of current at about 2 volts in an unprogrammed state.

9. The substrate of claim 1 wherein the memory matrix is erasable by ultraviolet light and further comprising a layer disposed adjacent the programmable memory matrix, said layer having properties sufficient to block ultraviolet light having a wavelength below about 400 nanometers.

10. A printhead for an ink jet printer containing the semiconductor substrate of claim 9.

11. The printhead of claim 10 wherein the layer comprises a material selected from the group consisting of a photoresist material, and a metal layer, said layer having ultraviolet light blocking properties.

12. The printhead of claim 10 wherein the layer comprises a polyimide nozzle plate.

13. An ink jet printer cartridge for an ink jet printer comprising:
a cartridge body having an ink supply source and
a printhead attached to the cartridge body in fluid communication with the ink supply source, the
printhead comprising:

 a substrate having a plurality of ink ejection devices;
 a plurality of driver devices for driving the plurality of ink ejection devices;
 a nonvolatile programmable memory matrix containing embedded programmable
 memory devices, the matrix being operatively connected to the ink jet
 printer for storing information for operation of the printer; and
 a nozzle plate attached to the substrate for ejecting ink there from upon activation
 of the ink ejection devices.

14. The ink jet printer cartridge of claim 13 wherein the embedded programmable
memory devices comprise transistors selected from the group consisting of PMOS and NMOS
floating gate transistors.

15. The ink jet printer cartridge of claim 13 wherein the embedded programmable memory devices have a memory density of greater than about 200 bits per square millimeter.

16. The ink jet printer cartridge of claim 13 wherein the programmable memory matrix comprises floating gate transistors.

17. The ink jet printer cartridge of claim 13 wherein the programmable memory matrix comprises more than 128 memory devices.

18. The ink jet printer cartridge of claim 13 wherein the embedded programmable memory devices are programmable by applying a voltage of greater than about 8 volts for at least about 100 microseconds.

19. The ink jet printer cartridge of claim 13 wherein the embedded programmable memory devices will pass from about 10 to about 200 microamps of current at about 2 volts in a programmed state.

20. The ink jet printer cartridge of claim 13 wherein the embedded programmable memory devices will pass less than 3 microamps of current at about 2 volts in an unprogrammed state.

21. The ink jet printer cartridge of claim 13 wherein the memory matrix is erasable by ultraviolet light and further comprising a photoresist layer disposed adjacent the programmable memory matrix, said photoresist layer having properties sufficient to block ultraviolet light having a wavelength below about 400 nanometers.

22. The ink jet printer cartridge of claim 13 wherein the memory matrix is erasable by ultraviolet light and the nozzle plate comprises a polyimide nozzle plate having properties sufficient to block ultraviolet light having a wavelength below about 400 nanometers.

23. A printhead for a micro-fluid ejecting device, the printhead comprising:
a plurality of fluid ejection devices;
a plurality of driver devices for driving the plurality of fluid ejection devices; and
a nonvolatile programmable memory matrix containing embedded programmable memory
devices, the matrix being capable of being operatively connected to a micro-fluid ejecting
device for storing information for operation of the micro-fluid ejecting device.

24. The printhead of claim 23, further comprising a controller wherein at least a
portion of the matrix is readable by the controller.

25. The printhead of claim 24, further comprising a controller wherein the at least a
portion of the matrix is directly readable by the controller.

26. The printhead of claim 23, wherein the programmable memory devices are
embedded in a semiconductor.

27. The printhead of claim 26, wherein the semiconductor comprises silicon.

28. The printhead of claim 23, wherein the driver devices comprise transistors.

EVIDENCE APPENDIX

1. McGraw-Hill Dictionary of Scientific and Technical Terms 4th Edition, McGraw-Hill, Inc., 1989, p. 1572. Not relied on except as authoritative evidence on page 4 of this appeal brief. Not entered by the Examiner prior to this appeal.

RELATED PROCEEDINGS APPENDIX

There are no related proceedings.